

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) A printing method comprising the steps of:
providing a print head having
a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and
an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups; and
printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, the step of printing images comprising the steps of:
 - (a) executing regular monochromatic mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area;
 - (b) executing lower-edge monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and
 - (c) executing color mode printing in the color area.

2. (Previously Presented) The printing method according to claim 1, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and the printing in each of steps (a) and (b) is interlaced printing.

3. (Previously Presented) The printing method according to claim 1, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

step (a) comprises a step of performing monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with the sub-scans;

step (b) comprises a step of performing the monochromatic mode main scans at least ($km - 1$) times alternately with the sub-scans; and

step (c) comprises a step of performing color mode main scans using the plurality of single chromatic nozzle groups and a specific achromatic nozzle group, alternately with sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$;

4. (Original) The printing method according to claim 1, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater; wherein

step (b) comprises a step of performing the sub- scans ($km - 1$) times.

5. (Cancel)

6. (Previously Presented) The printing method according to claim 1, wherein the step (c) comprises a step of:

starting color mode printing when a topmost nozzle of the plurality of single chromatic nozzle groups is in a position upside of a border of the monochromatic area and the color area.

7. (Original) The printing method according to claim 1, further comprising a step of:

(e) performing a sub-scan after step (b) and before step (c) such that the print head is placed at a specific position near an upper edge of the color area when a distance between the print head and the upper edge of the color area at the end of step (b) is less than a specific value.

8. (Original) The printing method according to claim 7, wherein step (e) includes a step of:

performing a sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of step (b), when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and step (c) is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the color area.

9. (Original) The printing method according to claim 1, wherein step (a) comprises a step of:

proceeding to step (b) if a first relative position of the print head in relation to the printing medium lies below a second relative position, the first relative position being defined to be a position reached by the print head when a subsequent sub-scan in the first sub-scan mode and all the sub-scans to be performed during step (b) are performed, the second relative position being defined to be a position such that when the print head is positioned at the second relative position and step (c) is performed starting from the second relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the color area.

10. (Original) The printing method according to claim 1, wherein
the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and

the first sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $p1 \times D$, where $p1$ is an integer constituting a prime with km .

11. (Original) The printing method according to claim 1, wherein

the first sub-scan mode is a mode for carrying out a non-constant sub-scan feeding that includes performing repeated combinations of sub-scans in variable feed increments.

12. (Cancel)

13. (Cancel)

14. (Original) The printing method according to claim 1, wherein

the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and

the second sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $p2 \times D$, where $p2$ is an integer constituting a prime with km .

15. (Cancel)

16. (Cancel)

17. (Previously Presented) A printing method comprising the steps of:

providing a print head having

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups; and

printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, the step of printing images comprising the steps of:

(a) executing regular color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area;

(b) executing lower-edge color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area;

(c) executing monochromatic mode printing in the monochromatic area.

18. (Previously Presented) The printing method according to claim 17, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines;

and

the printing in each of steps (a) and (b) is interlaced printing.

19. (Previously Presented) The printing method according to claim 17, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

step (a) comprises a step of performing color mode main scans using the plurality of single chromatic nozzle groups and specific achromatic nozzle group, alternately with the sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$;

step (b) comprises a step of performing the color mode main scans at least $(kc - 1)$ times alternately with the sub-scans; and

step (c) comprises a step of performing monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with sub-scans;

20. (Original) The printing method according to claim 17, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater; wherein

step (b) comprises a step of performing the sub-scans $(kc - 1)$ times.

21. (Original) The printing method according to claim 17, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater; wherein

step (c) comprises a step of performing the sub- scans $(km - 1)$ times.

22. (Previously Presented) The printing method according to claim 17, wherein the step (c) comprises a step of:

starting monochromatic mode printing when a topmost nozzle of the achromatic nozzle group is in a position upside of a border of the color area and the monochromatic area.

23. (Original) The printing method according to claim 17, comprising a step of:

(e) performing a sub-scan after step (b) and before step (c) such that the print head is placed at a specific position near an upper edge of the monochromatic area when a distance between the print head and the upper edge of the monochromatic area at the end of step (b) is less than a specific value.

24. (Original) The printing method according to claim 23, wherein step (e) includes a step of:

performing a sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of step (b), when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and step (c) is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the monochromatic area.

25. (Original) The printing method according to claim 17, wherein step (a) comprises a step of:

proceeding to step (b) if a first relative position of the print head in relation to the printing medium lies below a second relative position, the first relative position being defined to be a position reached by the print head when a subsequent sub-scan in the first sub-scan mode and all the sub-scans to be performed during step (b) are performed, the second relative position being defined to be a position such that when the print head is positioned at the second relative position and step (c) is performed starting from the second relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the monochromatic area.

26. (Original) The printing method according to claim 17, wherein

the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$,
where kc is an integer of 2 or greater and D is a pitch of main scan lines; and

the first sub-scan mode is a mode for carrying out a constant sub-scan feeding with
constant feed increments of $q1 \times D$, where $q1$ is an integer constituting a prime with kc .

27. (Original) The printing method according to claim 17, wherein

the first sub-scan mode is a mode for carrying out a non-constant sub-scan feeding that
includes performing repeated combinations of sub-scans in variable feed increments.

28. (Cancel)

29. (Cancel)

30. (Original) The printing method according to claim 17, wherein

the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$,
where kc is an integer of 2 or greater and D is a pitch of main scan lines; and

the second sub-scan mode is a mode for carrying out a constant sub-scan feeding with
constant feed increments of $q2 \times D$, where $q2$ is an integer constituting a prime with kc .

31. (Original) The printing method according to claim 30, wherein $q2$ is 1.

32. (Cancel)

33. (Previously Presented) A printing apparatus which prints images in a monochromatic area on a printing medium with an achromatic ink alone, and in a color area with chromatic inks, by ejecting ink drops from a nozzle to deposit the ink drops on the printing medium to form dots, comprising:

a printing head having:

a plurality of single-chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups;

a main scan drive unit that moves at least one of the printing head and the printing medium to perform main scanning;

a sub-scan drive unit that moves at least one of the printing head and the printing medium in a direction that intersects a main scanning direction to perform sub-scanning; and

a control unit that controls the printing head, the main scan drive unit and the sub-scan drive unit,

wherein the control unit has:

(a) a regular monochromatic mode unit that executes regular monochromatic mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area;

(b) a lower-edge monochromatic mode unit that executes lower-edge monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and

(c) a color mode unit that executes color mode printing in the color area.

34. (Previously Presented) The printing apparatus according to claim 33, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and the regular monochromatic mode unit and the lower-edge monochromatic mode unit, each executes interlaced printing.

35. (Previously Presented) The printing apparatus according to claim 33, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

the regular monochromatic mode unit performs monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with the sub-scans;

the lower-edge monochromatic mode unit performs the monochromatic mode main scans at least $(km - 1)$ times alternately with the sub-scans; and

the color mode unit performs color mode main scans using the plurality of single chromatic nozzle groups and a specific achromatic nozzle group, alternately with sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $k_c \times D$;

36. (Original) The printing apparatus according to claim 33, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater; wherein

the lower-edge monochromatic mode unit performs the sub-scans $(km - 1)$ times.

37. (Cancel)

38. (Previously Presented) The printing apparatus according to claim 33, wherein the color mode unit starts color mode printing when a topmost nozzle of the plurality of single chromatic nozzle groups is in a position upside of a border of the monochromatic area and the color area.

39. (Original) The printing apparatus according to claim 35, wherein the plurality of single chromatic nozzle groups comprise:

a cyan nozzle group for ejecting a cyan ink;

a magenta nozzle group for ejecting a magenta ink; and

a yellow nozzle group for ejecting a yellow ink,

the cyan nozzle group, magenta nozzle group, and yellow nozzle group are disposed in the order indicated in the direction of sub-scanning;

the achromatic nozzle group are equipped with $N_c \times 3$ nozzles arranged at a nozzle pitch $k_c \times D$ and are disposed in the area for accommodating the nozzles cyan nozzle group, magenta nozzle group, and yellow nozzle group; and

the specific achromatic nozzle group is disposed in the area for accommodating the nozzles of the cyan nozzle group in the direction of sub-scanning.

40. (Original) The printing apparatus according to claim 33, wherein the control unit further comprises:

a position adjusting feed unit that performs a sub-scan such that the print head is placed at a specific position near an upper edge of the color area when a distance between the print head and the upper edge of the color area at the end of lower-edge monochromatic mode printing is less than a specific value.

41. (Previously Presented) The printing apparatus according to claim 40, wherein the position adjusting feed unit performs the sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of lower-edge monochromatic mode printing, when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and color mode printing is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the color area.

42. (Previously Presented) The printing apparatus according to claim 33, wherein the regular monochromatic mode unit proceeds to lower-edge monochromatic mode printing in case that a first relative position of the print head in relation to the printing medium, assuming that a subsequent sub-scan based on the first sub-scan mode and all the sub-scans to be performed during lower-edge monochromatic mode printing are performed, lies below a second relative position of the print head in relation to the printing medium in which the main scan lines can be recorded without any intervals all the way from the upper edge of the color area, assuming that color mode printing is performed starting from the first relative position.

43. (Previously Presented) A printing apparatus which prints images in a monochromatic area on a printing medium with an achromatic ink alone, and in a color area with

chromatic inks, by ejecting ink drops from a nozzle to deposit the ink drops on the printing medium to form dots, comprising:

a printing head having:

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups;

a main scan drive unit that moves at least one of the printing head and the printing medium to perform main scanning;

a sub-scan drive unit that moves at least one of the printing head and the printing medium in a direction that intersects a main scanning direction to perform sub-scanning; and

a control unit that controls the printing head, the main scan drive unit and the sub-scan drive unit,

wherein the control unit has:

(a) a regular color mode unit that executes regular color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area;

(b) a lower-edge color mode unit that executes lower-edge color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots

are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area; and

(c) a monochromatic mode unit that executes monochromatic mode printing in the monochromatic area.

44. (Previously Presented) The printing apparatus according to claim 43, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines;

and

the regular color mode unit and the lower-edge color mode unit,

45. (Currently Amended) The printing apparatus according to claim ~~44~~43, wherein the single chromatic nozzle groups have mutually equal numbers of Nc nozzles arranged at a nozzle pitch $kc \times D$, where Nc is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has Nm nozzles arranged at a nozzle pitch $km \times D$, where Nm is an integer greater than Nc , km is an integer equal to kc / J and J is a positive integer; wherein

the regular color mode unit performs color mode main scans using the plurality of single chromatic nozzle groups and specific achromatic nozzle group alternately with the sub-scans, the

specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$;

the lower-edge color mode unit performs the color mode main scans at least $(kc - 1)$ times alternately with the sub-scans; and

the monochromatic mode unit performs monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups alternately with sub-scans.

46. (Original) The printing apparatus according to claim 43, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater; wherein

the lower-edge color mode unit performs the sub-scans $(kc - 1)$ times.

47. (Cancel)

48. (Previously Presented) The printing apparatus according to claim 43, wherein the monochromatic mode unit starts monochromatic mode printing when a topmost nozzle of the achromatic nozzle group is in a position upside of a border of the color area and the monochromatic area.

49. (Original) The printing apparatus according to claim 45, wherein the plurality of single chromatic nozzle groups comprise:

a cyan nozzle group for ejecting a cyan ink;

a magenta nozzle group for ejecting a magenta ink; and

a yellow nozzle group for ejecting a yellow ink,

the cyan nozzle group, magenta nozzle group, and yellow nozzle group are disposed in the order indicated in the direction of sub-scanning;

the achromatic nozzle group are equipped with $N_c \times 3$ nozzles arranged at a nozzle pitch $k_c \times D$ and are disposed in the area for accommodating the nozzles cyan nozzle group, magenta nozzle group, and yellow nozzle group; and

the specific achromatic nozzle group is disposed in the area for accommodating the nozzles of the cyan nozzle group in the direction of sub-scanning.

50. (Original) The printing apparatus according to claim 43, wherein the control unit further comprises:

a position adjusting feed unit that performs a sub-scan whereby the print head is placed at a specific position near an upper edge of the monochromatic area when the distance between the print head and the upper edge of the monochromatic area at the end of lower-edge color mode printing is less than a specific value.

51. (Previously Presented) The printing apparatus according to claim 50, wherein the position adjusting feed unit performs the sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of lower-edge color mode printing when the second relative position falls outside a permissible range of the first relative position the first relative position being defined to be a position such that when the print head is positioned at the first relative position and monochromatic mode printing is performed starting from the first relative position, the main scan lines can be recorded without any intervals all the way from the upper edge of the monochromatic area.

52. (Previously Presented) The printing apparatus according to claim 43, wherein the regular color mode unit proceeds to lower-edge color mode printing in case that a first relative position of the print head in relation to the printing medium, assuming that a subsequent sub-scan based on the first sub-scan mode and all the sub-scans to be performed during lower-edge color mode printing are performed, lies below a second relative position of the print head in relation to the printing medium in which the main scan lines can be recorded without any intervals all the way from the upper edge of the monochromatic area, assuming that monochromatic mode printing is performed starting from the second relative position.

53. (Previously Presented) A computer program product for printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area

with the chromatic inks, using a computer, the computer being connected with a printing device having a printing head equipped with

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups, the computer program product comprising:

a computer readable medium; and

a computer program stored on the computer readable medium, the computer program comprising:

(a) a regular monochromatic mode program for causing the computer to execute regular monochromatic mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area;

(b) a lower-edge monochromatic mode program for causing the computer to execute lower-edge monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and

(c) a color mode program for causing the computer to execute color mode printing in the color area.

54. (Previously Presented) A computer program product for printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, using a computer, the computer being connected with a printing device having a printing head equipped with

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups, the computer program product comprising:

a computer readable medium; and

a computer program stored on the computer readable medium, the computer program comprising:

(a) a regular color mode program for causing the computer to execute regular color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area;

(b) a lower-edge color mode program for causing the computer to execute lower-edge color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is less than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area;

(c) a monochromatic mode program for causing the computer to execute monochromatic mode printing in the monochromatic area.

55. (Previously Presented) A printing method comprising the steps of:

providing a print head having

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups; and

printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, the step of printing images comprising the steps of:

(a) executing monochromatic mode printing in the monochromatic area;

(b) executing upper-edge color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area; and

(c) executing regular color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the color area.

56. (Previously Presented) The printing method according to claim 55, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines; and the printing in each of steps (b) and (c) is interlaced printing.

57. (Previously Presented) The printing method according to claim 55, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

step (a) comprises a step of performing monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with the sub-scans;

step (b) comprises a step of performing color mode main scans at least $(kc - 1)$ times using the plurality of single chromatic nozzle groups and a specific achromatic nozzle group, alternately with sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$; and

step (c) comprises a step of performing color mode main scans alternately with the sub-scans.

58. (Previously Presented) The printing method according to claim 55, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater; wherein

step (b) comprises a step of performing the sub-scans ($kc - 1$) times.

59. (Previously Presented) The printing method according to claim 55, wherein the step (b) comprises a step of:

starting upper-edge color mode printing when a topmost nozzle of the plurality of single chromatic nozzle groups is in a position upside of a border of the monochromatic area and the color area.

60. (Previously Presented) The printing method according to claim 55, further comprising a step of:

(d) performing a sub-scan after step (a) and before step (b) such that the print head is placed at a specific position near an upper edge of the color area when a distance between the print head and the upper edge of the color area at the end of step (a) is less than a specific value.

61. (Previously Presented) The printing method according to claim 60, wherein step (d) includes a step of:

performing a sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of step (a), when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and step (b) is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the color area.

62. (Previously Presented) The printing method according to claim 55, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines; and the second sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $q1 \times D$, where $q1$ is an integer constituting a prime with kc .

63. (Previously Presented) The printing method according to claim 55, wherein the second sub-scan mode is a mode for carrying out a non-constant sub-scan feeding that includes performing repeated combinations of sub-scans in variable feed increments.

64. (Previously Presented) The printing method according to claim 55, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines; and

the first sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $q_2 \times D$, where q_2 is an integer constituting a prime with k .

65. (Currently Amended) The printing method according to claim ~~14~~64, wherein q_2 is 1.

66. (Previously Presented) A printing method comprising the steps of:
providing a print head having
a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and
an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups; and
printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, the step of printing images comprising the steps of:

- (a) executing color mode printing in the color area;
- (b) executing upper-edge monochromatic mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and
- (c) executing regular monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a

maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area.

67. (Previously Presented) The printing method according to claim 66, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and the printing in each of steps (b) and (c) is interlaced printing.

68. (Previously Presented) The printing method according to claim 66, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

step (a) comprises a step of performing color mode main scans using the plurality of single chromatic nozzle groups and specific achromatic nozzle group, alternately with the sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$;

step (b) comprises a step of performing monochromatic mode main scans at least $(km - 1)$ times using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with sub-scans; and

step (c) comprises a step of performing the monochromatic mode main scans alternately with the sub-scans.

69. (Previously Presented) The printing method according to claim 66, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater; wherein

step (b) comprises a step of performing the sub- scans $(km - 1)$ times.

70. (Previously Presented) The printing method according to claim 66, wherein the step (b) comprises a step of:

starting upper-edge monochromatic mode printing when a topmost nozzle of the achromatic nozzle group is in a position upside of a border of the color area and the monochromatic area.

71. (Previously Presented) The printing method according to claim 66, comprising a step of:

(d) performing a sub-scan after step (a) and before step (b) such that the print head is placed at a specific position near an upper edge of the monochromatic area when a distance

between the print head and the upper edge of the monochromatic area at the end of step (a) is less than a specific value.

72. (Previously Presented) The printing method according to claim 71, wherein step (d) includes a step of:

performing a sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of step (a), when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and step (b) is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the monochromatic area.

73. (Previously Presented) The printing method according to claim 66, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and the second sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $p1 \times D$, where $p1$ is an integer constituting a prime with km .

74. (Previously Presented) The printing method according to claim 66, wherein

the second sub-scan mode is a mode for carrying out a non-constant sub-scan feeding that includes performing repeated combinations of sub-scans in variable feed increments.

75. (Previously Presented) The printing method according to claim 66, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and the first sub-scan mode is a mode for carrying out a constant sub-scan feeding with constant feed increments of $p2 \times D$, where $p2$ is an integer constituting a prime with km .

76. (Previously Presented) A printing apparatus which prints images in a monochromatic area on a printing medium with an achromatic ink alone, and in a color area with chromatic inks, by ejecting ink drops from a nozzle to deposit the ink drops on the printing medium to form dots, comprising:

- a printing head having:
 - a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and
 - an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups;
- a main scan drive unit that moves at least one of the printing head and the printing medium to perform main scanning;

a sub-scan drive unit that moves at least one of the printing head and the printing medium in a direction that intersects a main scanning direction to perform sub-scanning; and

a control unit that controls the printing head, the main scan drive unit and the sub-scan drive unit,

wherein the control unit has:

(a) a monochromatic mode unit that executes regular monochromatic mode printing in the monochromatic area;

(b) a upper-edge color mode unit that executes upper-edge color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area; and

(c) a regular color mode unit that executes regular color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the color area.

77. (Previously Presented) The printing apparatus according to claim 76, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater and D is a pitch of main scan lines; and

the upper-edge color mode unit and the regular color mode unit each executes interlaced printing.

78. (Previously Presented) The printing apparatus according to claim 76, wherein the single chromatic nozzle groups have mutually equal numbers of N_c nozzles arranged at a nozzle pitch $kc \times D$, where N_c is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has N_m nozzles arranged at a nozzle pitch $km \times D$, where N_m is an integer greater than N_c , km is an integer equal to kc / J and J is a positive integer; wherein

the monochromatic mode unit performs monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups, alternately with the sub-scans;

the upper-edge color mode unit performs color mode main scans at least $(kc - 1)$ times using the plurality of single chromatic nozzle groups and a specific achromatic nozzle group, alternately with sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of N_c nozzles arranged at a nozzle pitch $kc \times D$; and

the regular color mode unit performs color mode main scans alternately with the sub-scans.

79. (Previously Presented) The printing apparatus according to claim 76, wherein the nozzles of the single chromatic nozzle groups are arranged at a nozzle pitch $kc \times D$, where kc is an integer of 2 or greater; wherein

the upper-edge color mode unit performs the sub-scans $(kc - 1)$ times.

80. (Previously Presented) The printing apparatus according to claim 76, wherein the upper-edge color mode unit starts upper-edge color mode printing when a topmost nozzle of the plurality of single chromatic nozzle groups is in a position upside of a border of the monochromatic area and the color area.

81. (Previously Presented) The printing apparatus according to claim 78, wherein the plurality of single chromatic nozzle groups comprise:

a cyan nozzle group for ejecting a cyan ink;

a magenta nozzle group for ejecting a magenta ink; and

a yellow nozzle group for ejecting a yellow ink,

the cyan nozzle group, magenta nozzle group, and yellow nozzle group are disposed in the order indicated in the direction of sub-scanning;

the achromatic nozzle group are equipped with $N_c \times 3$ nozzles arranged at a nozzle pitch $k_c \times D$ and are disposed in the area for accommodating the nozzles cyan nozzle group, magenta nozzle group, and yellow nozzle group; and

the specific achromatic nozzle group is disposed in the area for accommodating the nozzles of the cyan nozzle group in the direction of sub-scanning.

82. (Previously Presented) The printing apparatus according to claim 76, wherein the control unit further comprises:

a position adjusting feed unit that performs a sub-scan such that the print head is placed at a specific position near an upper edge of the color area when a distance between the print head and the upper edge of the color area at the end of monochromatic mode printing is less than a specific value.

83. (Currently Amended) The printing apparatus according to claim ~~61~~82, wherein the position adjusting feed unit performs the sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of monochromatic mode printing, when the second relative position falls outside a permissible range of the first relative position, the first relative position being defined to be a position such that when the print head is positioned at the first relative position and upper-edge color mode printing is performed starting from the first relative position, the main scan lines can be recorded without any gaps all the way from the upper edge of the color area.

84. (Previously Presented) A printing apparatus which prints images in a monochromatic area on a printing medium with an achromatic ink alone, and in a color area with chromatic inks, by ejecting ink drops from a nozzle to deposit the ink drops on the printing medium to form dots, comprising:

a printing head having:

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups;

a main scan drive unit that moves at least one of the printing head and the printing medium to perform main scanning;

a sub-scan drive unit that moves at least one of the printing head and the printing medium in a direction that intersects a main scanning direction to perform sub-scanning; and

a control unit that controls the printing head, the main scan drive unit and the sub-scan drive unit,

wherein the control unit has:

(a) a color mode unit that executes color mode printing in the color area;

(b) a upper-edge monochromatic mode unit that executes upper-edge monochromatic mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and

(c) a regular monochromatic mode unit that executes regular monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area.

85. (Previously Presented) The printing apparatus according to claim 84, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater and D is a pitch of main scan lines; and

the upper-edge monochromatic mode unit and the regular monochromatic mode unit each executes interlaced printing.

86. (Previously Presented) The printing apparatus according to claim 84, wherein the single chromatic nozzle groups have mutually equal numbers of Nc nozzles arranged at a nozzle pitch $kc \times D$, where Nc is an integer of 2 or greater, kc is an integer of 2 or greater and D is a pitch of main scan lines;

the achromatic nozzle group has Nm nozzles arranged at a nozzle pitch $km \times D$, where Nm is an integer greater than Nc , km is an integer equal to kc / J and J is a positive integer; wherein

the color mode unit performs color mode main scans using the plurality of single chromatic nozzle groups and specific achromatic nozzle group alternately with the sub-scans, the specific achromatic nozzle group being selected from the achromatic nozzle group and consisting of Nc nozzles arranged at a nozzle pitch $kc \times D$;

the upper-edge monochromatic mode unit performs monochromatic mode main scans using the achromatic nozzle group but without using the single chromatic nozzle groups at least $(km - 1)$ times alternately with sub-scans; and

the regular monochromatic mode unit performs the monochromatic mode main scans alternately with the sub-scans.

87. (Previously Presented) The printing apparatus according to claim 84, wherein the nozzles of the achromatic nozzle group are arranged at a nozzle pitch $km \times D$, where km is an integer of 2 or greater; wherein

the upper-edge monochromatic mode unit performs the sub- scans ($km - 1$) times.

88. (Previously Presented) The printing apparatus according to claim 84, wherein the upper-edge monochromatic mode unit starts upper-edge monochromatic mode printing when a topmost nozzle of the achromatic nozzle group is in a position upside of a border of the color area and the monochromatic area.

89. (Previously Presented) The printing apparatus according to claim 86, wherein the plurality of single chromatic nozzle groups comprise:

a cyan nozzle group for ejecting a cyan ink;

a magenta nozzle group for ejecting a magenta ink; and

a yellow nozzle group for ejecting a yellow ink,

the cyan nozzle group, magenta nozzle group, and yellow nozzle group are disposed in the order indicated in the direction of sub-scanning;

the achromatic nozzle group are equipped with $N_c \times 3$ nozzles arranged at a nozzle pitch $k_c \times D$ and are disposed in the area for accommodating the nozzles cyan nozzle group, magenta nozzle group, and yellow nozzle group; and

the specific achromatic nozzle group is disposed in the area for accommodating the nozzles of the cyan nozzle group in the direction of sub-scanning.

90. (Previously Presented) The printing apparatus according to claim 84, wherein the control unit further comprises:

a position adjusting feed unit that performs a sub-scan whereby the print head is placed at a specific position near an upper edge of the monochromatic area when the distance between the print head and the upper edge of the monochromatic area at the end of color mode printing is less than a specific value.

91. (Previously Presented) The printing apparatus according to claim 90, wherein the position adjusting feed unit performs the sub-scan such that the print head is put to a first relative position in relation to the printing medium from a second relative position at which the print head is located at the end of color mode printing, when the second relative position falls outside a permissible range of the first relative position the first relative position being defined to be a position such that when the print head is positioned at the first relative position and upper-edge monochromatic mode printing is performed starting from the first relative position, the main scan

lines can be recorded without any intervals all the way from the upper edge of the monochromatic area.

92. (Previously Presented) A computer program product for printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, using a computer, the computer being connected with a printing device having a printing head equipped with

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups, the computer program product comprising:

a computer readable medium; and

a computer program stored on the computer readable medium, the computer program comprising:

(a) a monochromatic mode program for causing the computer to execute regular monochromatic mode printing in the monochromatic area;

(b) a upper-edge color mode program for causing the computer to execute upper-edge color mode printing whereby sub-scans are performed in a first sub-scan mode, and dots are formed along the main scan lines in the color area in the vicinity of the border with the monochromatic area; and

(c) a regular color mode program for causing the computer to execute color mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the color area.

93. (Previously Presented) A computer program product for printing images in a monochromatic area on a printing medium with the achromatic ink alone, and in a color area with the chromatic inks, using a computer, the computer being connected with a printing device having a printing head equipped with

a plurality of single chromatic nozzle groups for ejecting mutually different chromatic inks, each consisting of plurality of nozzles, and

an achromatic nozzle group for ejecting achromatic ink consisting of a greater number of nozzles than each of the single chromatic nozzle groups, the computer program product comprising:

a computer readable medium; and

a computer program stored on the computer readable medium, the computer program comprising:

(a) a color mode program for causing the computer to execute color mode printing in the color area;

(b) a upper-edge monochromatic mode program for causing the computer to execute upper-edge monochromatic mode printing whereby sub-scans are performed in a first sub-scan

mode, and dots are formed along the main scan lines in the monochromatic area in the vicinity of a border with the color area; and

(c) a regular monochromatic mode program for causing the computer to execute regular monochromatic mode printing whereby sub-scans are performed in a second sub-scan mode in which a maximum sub-scan feed increment is greater than a maximum sub-scan feed increment of the first sub-scan mode, and dots are formed along the main scan lines in the monochromatic area.